Spectral Dynamics

SD 101A

Optimum Performance Check

SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO

SD101A DYNAMIC ANALYZER - OPTIMUM PERFORMANCE CHECKS

1. For the following checks, operate the SD101A from a Variac®-type power source set initially for 115 volts rms.

2. Install 5 Hz or 10 Hz crystal filter(s) and allow at least 45 minutes for the crystal ovens to stabilize.

> NOTE
>
> The SD101A contains mercury-wetted relays. Operation in other than its normal upright position may produce a false indication that the unit is inoperative. However, for troubleshooting or calibration purposes, it may be gently positioned on its side and operated satisfactorily, provided the mercury within the relays has not shifted.

3. From a Model SD104A Sweep Oscillator, connect the constant amplitude sine wave output and the variable sine wave output to the TUNING INPUT and SIGNAL INPUT, respectively, of the Model SD101A.

4. Set the SD104A for 100 Hz, with a signal input level to the SD101A of 1 volt rms. Adjust the TUNING INPUT control on the SD101A for a mid-scale indication on the TUNING AMPLITUDE meter.

5. Rotate the front panel GAIN control counter clockwise to the CALIBRATED detent position. Note: On early SD101A units that do not have the detent position, verify the correct gain setting of the Input Amplifier per the instruction manual.

6. Calibrate the SD101A in the normal manner (RANGE and MULTIPLIER switches to CAL, meter to "7", etc.). Return the RANGE and MULTIPLIER switches to the 1.0 volt, X1, positions, respectively.

7. If the SD101A signal meter does not indicate 1 volt, ±2%, adjust the appropriate FILTER - CAL control as required. Rotate the RANGE and MULTIPLIER switches to their CAL positions and adjust potentiometer R7 (top of chassis, left rear) for a meter indication of "7". Return the RANGE and MULTIPLIER switches to the 1.0 volt, X1 positions, respectively.

8. Connect an oscilloscope and true-rms meter to the FILTERED OUTPUT (FSO) terminals. While viewing the FSO waveform on the scope, turn the FSO level control fully clockwise and note that the amplitude is at least 10 volts rms. Readjust the FSO output level for 1.0 volt rms and then slowly turn the FREQ ADJ control while observing the scope. Throughout the change in the FSO amplitude, the waveform should remain a clean sine wave. Distortion of the waveform indicates that the carrier converter is not balanced or has failed. Leave the FREQ ADJ control in a "peaked" position.

9. Reduce the input line voltage to 105 volts rms and note that the FSO and front panel signal meter indications do not decrease by more than 3%. A decrease in excess of 3% is an indication that one or more tubes need replacement. Gently place the unit on its side and first check the power supply as follows: With the line voltage reduced to 105 volts rms, the power supply should be regulating firmly at 150 volts dc, with ripple less than 5 mv p-p. If not, replace power supply tubes as necessary and check capacitor C4 for possible replacement.

   Assuming proper operation of the power supply, next check the carrier converter circuitry as follows: Measure the carrier amplitude at rear BNC connector J11 (CARRIER SIG OUT) for 50 to 70 volts p-p. Reducing the line voltage from 115 to 105 volts rms should cause no more than 3-5 volts p-p decrease in the carrier amplitude, and in any case, the amplitude should not fall below 50 volts p-p. If necessary, substitute new tubes for V11 and V12 and then V40, V41 and V42. While varying the line voltage between 105 and 115 volts rms, change tubes as required in the phase shifter circuit cards (A4 and A5) to minimize the changes in signal level at TP14 and TP15.

   If the output amplitude and signal meter indications are still in excess of tolerance, methodically substitute tubes throughout the remainder of the instrument, starting with the input amplifier and then the filter driver, tuned amplifier, meter amplifier, demodulator driver and FSO amplifier, in that order. Restore the input line voltage to 115 volts rms.

10. Remove the SD104A variable sine wave signal connected to the SIGNAL INPUT terminal. Using a second audio oscillator, apply 1 volt rms, 100 Hz, to the SIGNAL INPUT terminals. Tune the SD104A to approximately 50 Hz and turn the SD101A MULTIPLIER switch to the 0.01 position. Slowly tune the SD104A for a peak indication on the SD101A signal meter and then detune it slightly for a noticeable "beat" indication. The meter indication should be less than the 6 dB mark or more than 44 dB down from full scale. If not, the carrier converter balance adjustments should be performed per paragraph 4-8. of the instruction manual.

    Tune the SD104A to approximately 33 Hz and repeat the preceding step for meter indication of at least 44 dB down. If necessary, adjust the carrier amplitude balance and the oscillator phase controls per paragraph 4-8. of the instruction manual.

    Repeat the two preceding steps, as necessary, for signal meter indications at least 44 dB down at both 50 and 33 Hz.

11. Restore the variable sine wave signal (1 volt rms, 100 Hz) to the SIGNAL INPUT terminals on the SD101A.

    While observing the signal meter and the true-rms meter indications, sweep the frequency of the SD104A from 10 Hz to 10 kHz. The signal meter should not vary more than ±2% and the FSO variation should be less than ±0.25 dB.

11. (Cont'd)

Decrease the amplitude of the input signal to the SD101A by 30 dB and recheck the frequency response. If the FSO varies in excess of ±0.5 dB, the most probable cause is that the phase shifter circuit cards are out of calibration and should be returned to the factory for repair and calibration.

12. Restore the SD101A input signal to 1 volt rms, 100 Hz and note the indications on the signal meter and the true-rms meter. Turn the RANGE and MULTIPLIER switches to the 100 volts and X0.01 positions, respectively. Increase the sensitivity of the true-rms meter by 40 dB and note that both meters indicate within ±1 dB of the preceding indications.

13. Remove the input signal and, within 10 seconds, the signal meter indication should decrease to less than the "0" dB mark, or 50 dB down from full scale. The FSO amplitude should be at least 50 dB below the full scale level noted in step 12. above. If the FSO residual signal level is too high, it may be corrected by replacing V17, as heater-to-cathode leakage will often cause the FSO level to be affected by abnormal line noise.

14. Set the RANGE and MULTIPLIER switches to the 1.0 volt and X1 positions, respectively. Connect a 100 kΩ resistor across the front panel RECORDER OUTPUT terminals and then adjust the recorder output for 1 Vdc, as measured with a digital voltmeter. Turn the RANGE switch to the 100 volts position and note that the recorder output level decreases by 40 dB, ±0.5 dB (approximately 9.5 to 10.7 mV). If not, adjust R269 (under the chassis adjacent to V10).

15. Reduce the input signal to 100 mV rms and place the RANGE switch in the 0.1 volt position. Adjust the input signal level as required for full scale indication on the signal meter and adjust the RECORDER OUTPUT for 1 Vdc.

Increase the input signal to 200 mV rms (6 dB increase) and the recorder output level should then be 2 volts dc, ±0.5 dB (roughly 1.9 to 2.1 Vdc). This demonstrates the overload capability of the recorder output circuitry.

16. Restore the input signal level to 100 mV and set the FILTERED OUTPUT level for 1V rms. Increase the input signal to 280 mV rms (9 dB increase) and the FSO level should increase by 9 dB, ±0.5 dB, or approximately 2.65 to 3 volts. This demonstrates the overload capability of the FSO circuitry and the Input Amplifier.

17. A Model SD101A that successfully meets the requirements of the preceding performance checks can be considered to be operating normally. No further calibration is necessary unless the unit will be used for very demanding operation over a wide dynamic range.

SECTION IV

MAINTENANCE

4-1. GENERAL.

The various assemblies in the analyzer, with major circuit locations are shown in figures 12 and 13. Viewing the bottom of the analyzer it is seen that the unit is comprised of four major assemblies which are designated: (1) Low Frequency; (2) High Frequency; (3) Carrier Converter; (4) Power Supply. The wideband phase shift networks are plug-in assemblies and are shown in figure 12, Item 3. The general location of specific circuits may be found by referring to figures 12 and 13.

4-2. TEST POINTS.

When trouble shooting and aligning the SD101A there are test points referenced on the Block Diagram and Schematic. These test points may be physically located by referring to figure 14. Waveforms and voltage levels at each corresponding test point are shown in the latter part of this section.

4-3. REPAIR AND MAINTENANCE.

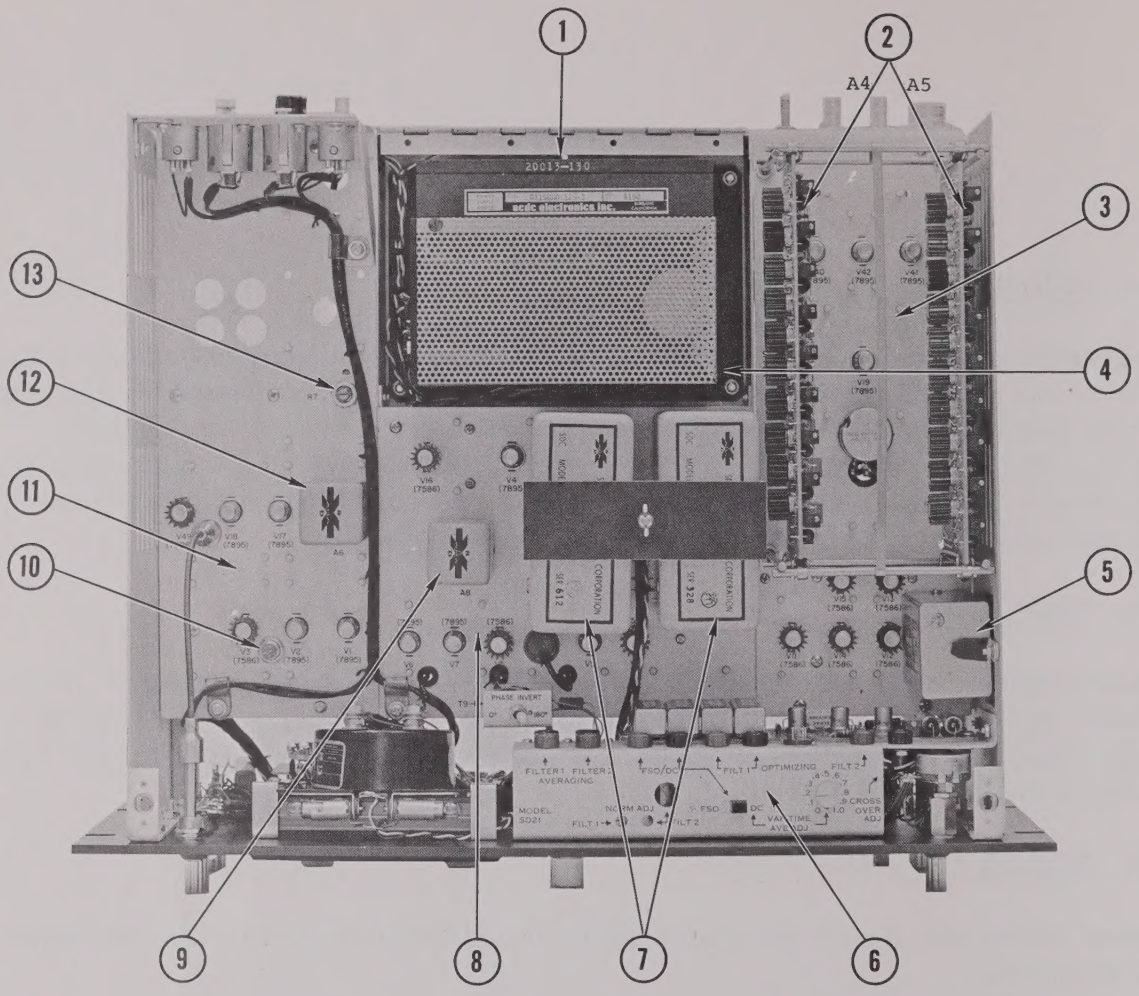
Repair and maintenance of all circuits can be accomplished by the user with the following exceptions:

1. Wideband Phase Shifters (figures 15 and 16)

Repair by the user of the circuits on the plug-in printed circuit boards should be limited to replacement of tubes, repair of broken leads and replacement of any of the 1/4 watt, 5%, 1000Ω resistors. Do not disturb the factory adjustments or precision components. If boards are in need of recalibration and adjustments (Ref. Item 5b Trouble Shooting Guide) they should be returned to the factory. Return of items to the factory is governed by the paragraphs Warranty and Shipping found in the preface of this manual.

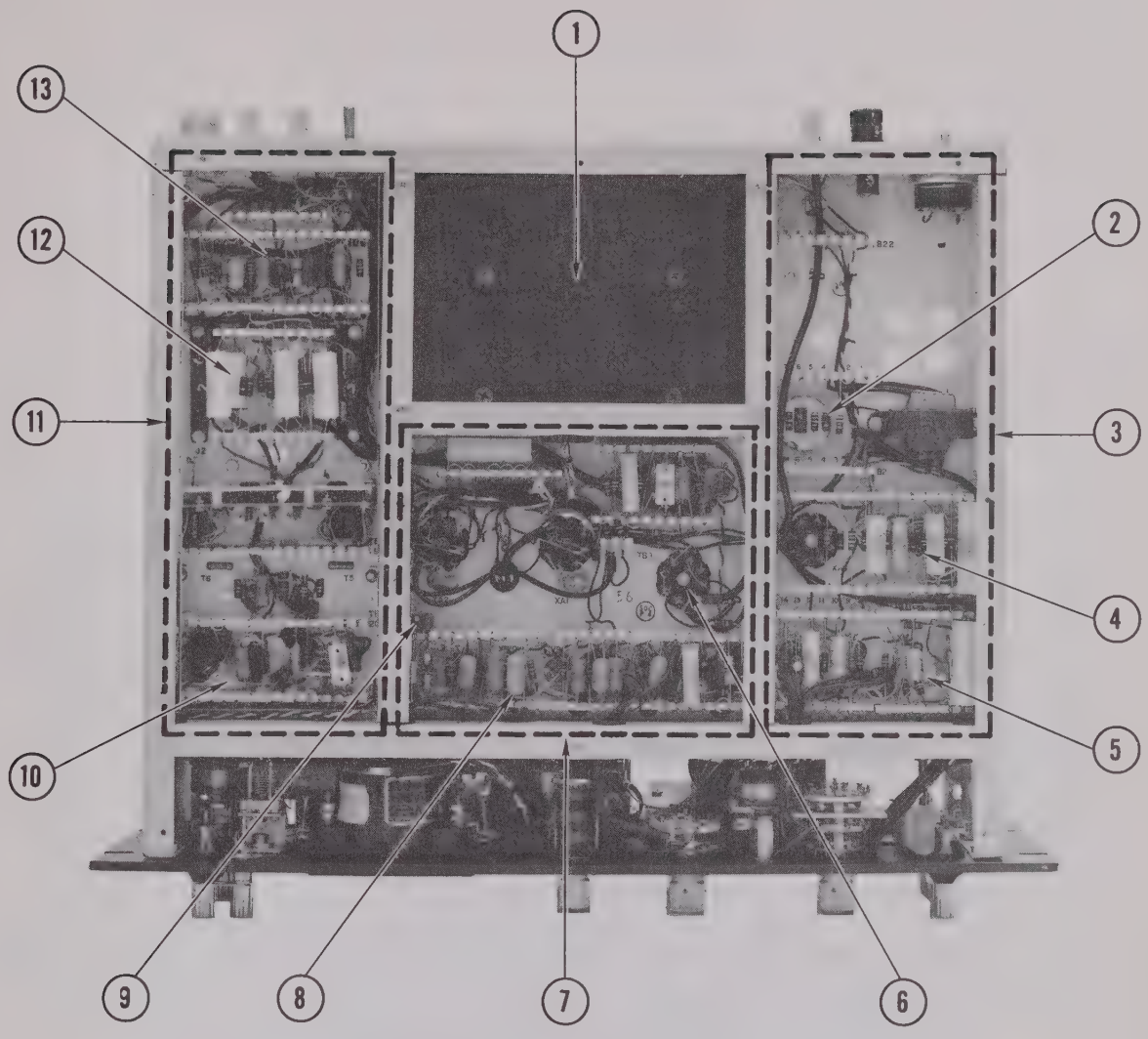
2. Crystal Filters

Due to the complexity of the crystal filters, repair should be performed only by the factory. Normally, the filters will perform indefinitely without maintenance or repair. The most common failure encountered is the malfunction of the thermostat controlling the oven heater. Thermostat failure is indicated by excessive shift in center frequency showing up as an apparent change in SD101A gain. Insertion-loss of the filters becomes very high. Occasionally, a filter will be dropped or mishandled which can result in damage to the crystals. If a filter requires repair, return it to the factory along



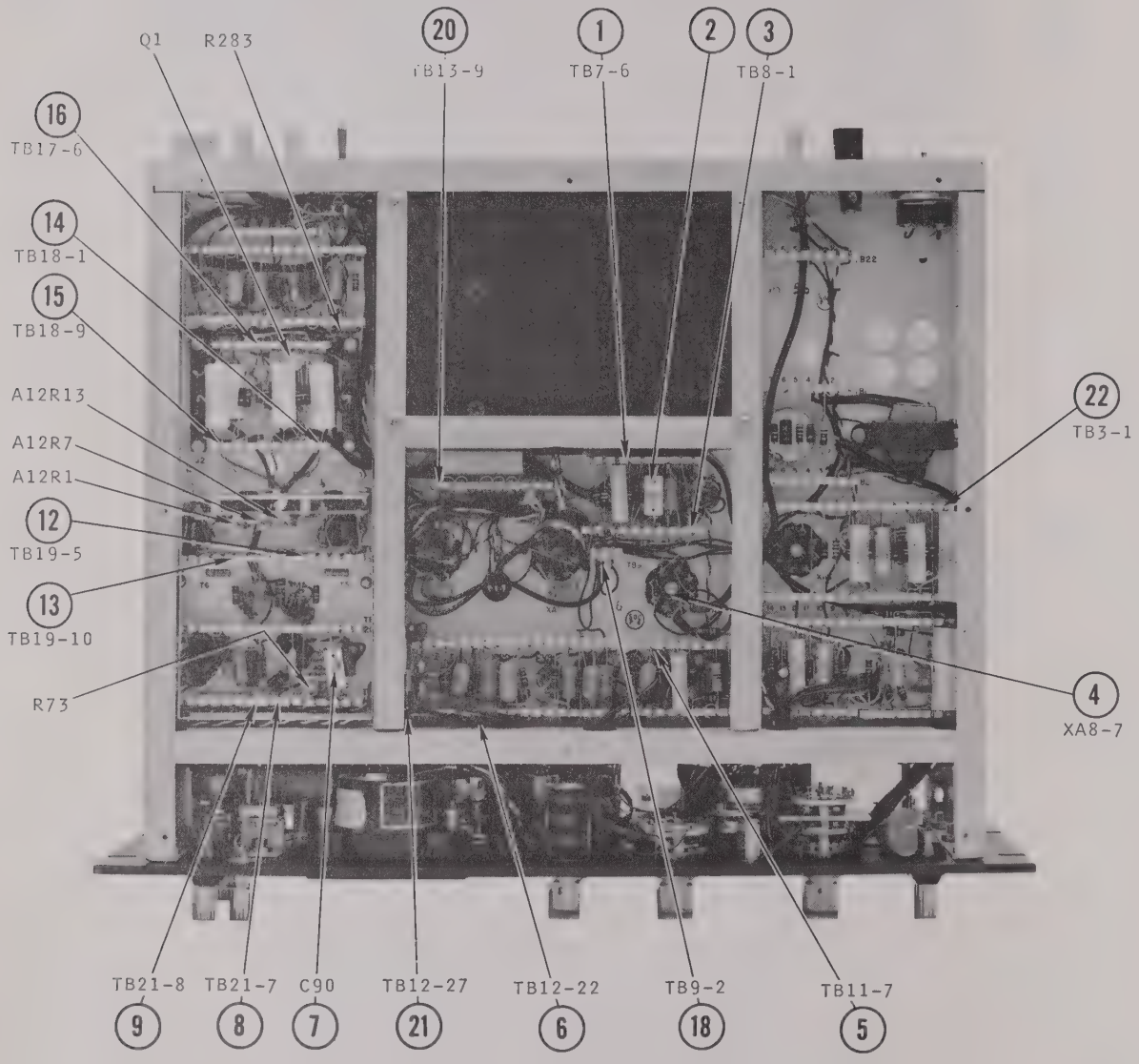
1 POWER SUPPLY MODULE (A7)
2 WIDE BAND PHASE SHIFT ASSEMBLIES (A4 UPPER - A5 LOWER)
3 CARRIER CONVERTER SECTION
4 B+ LEVEL ADJUSTMENT
5 100 kHz CRYSTAL OVEN ASSEMBLY (A3)
6 SD21 AUTOMATIC BANDWIDTH SWITCHING ADAPTER (A10)
7 PLUG-IN BANDPASS FILTERS (A1 & A2)
8 HIGH FREQUENCY SECTION
9 PLUG-IN DEMODULATOR ASSEMBLY (A8)
10 CALIBRATED GAIN CONTROL (R19)
11 LOW FREQUENCY SECTION
12 PLUG-IN 30 kHz LOW-PASS FILTER ASSEMBLY (A6)
13 REFERENCE CALIBRATION LEVEL ADJUSTMENT (R7)

Figure 12. Top Chassis View



1 POWER SUPPLY MODULE (Bottom side)
2 60 Hz CALIBRATION CIRCUIT (INTERNAL CAL REFERENCE)
3 LOW FREQUENCY SECTION
4 FILTERED SIGNAL OUTPUT CIRCUIT (FSO)
5 INPUT AMPLIFIER CIRCUIT
6 DEMODULATOR CIRCUIT
7 HIGH FREQUENCY SECTION
8 TUNED AMPLIFIER & METER AMPLIFIER CIRCUIT
9 DC OUTPUT LINEARITY ADJUST (R269)
10 100 kHz REFERENCE OSCILLATOR CIRCUIT
11 CARRIER CONVERTER SECTION
12 TUNING SIGNAL INPUT AMPLIFIER
13 CARRIER SIDEBAND AMPLIFIER AND FILTER

Figure 13. Bottom Chassis View



NOTE: ENCIRCLED NUMBERS CORRESPOND TO TEST POINT DESIGNATIONS ON THE SCHEMATIC, DWG. 10101.

Figure 14. Test Points & Internal Adjustments

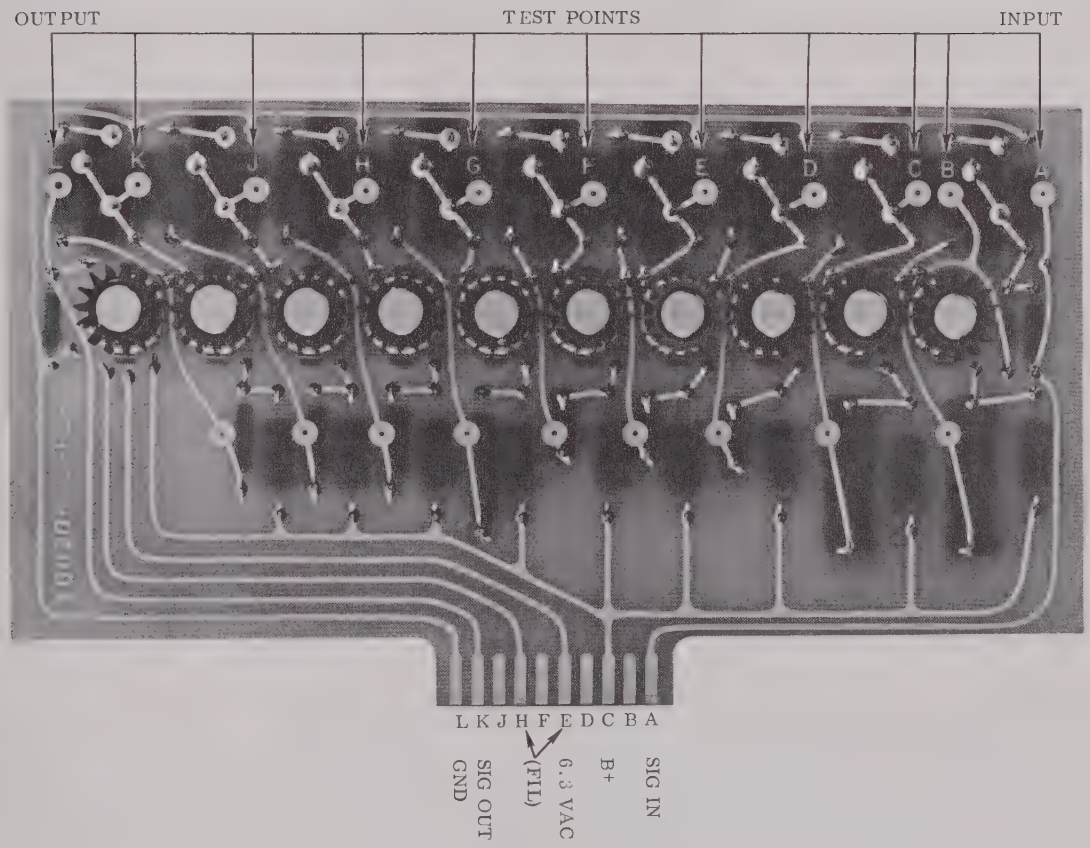


Figure 15. Wideband Phase Shift Circuit Board - Layout and Test Points

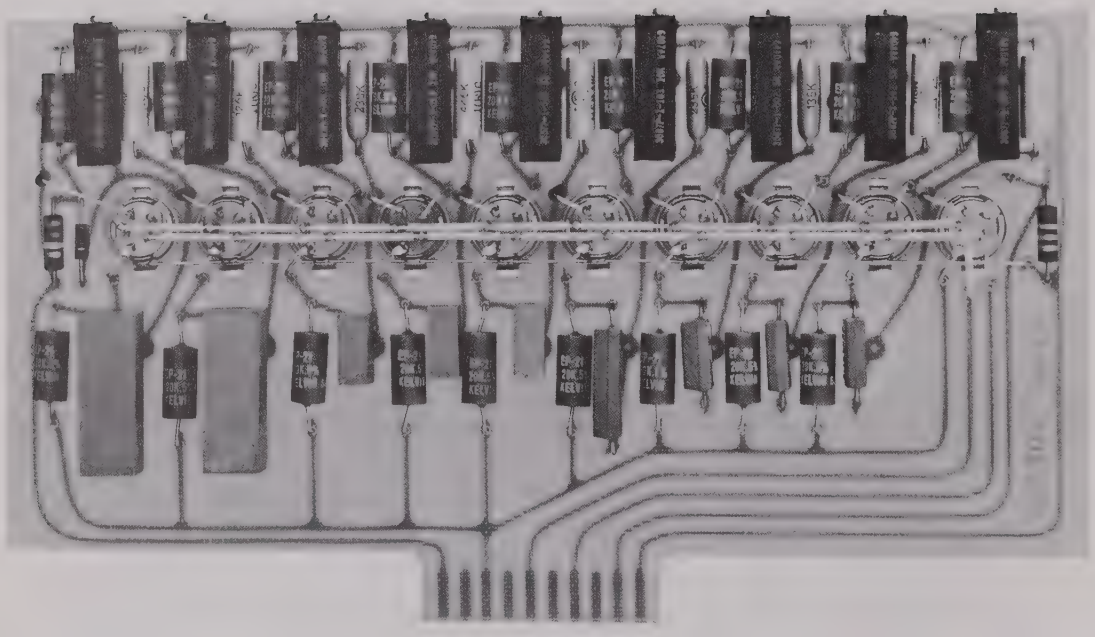


Figure 16. Printed Circuit Board (Component Side)

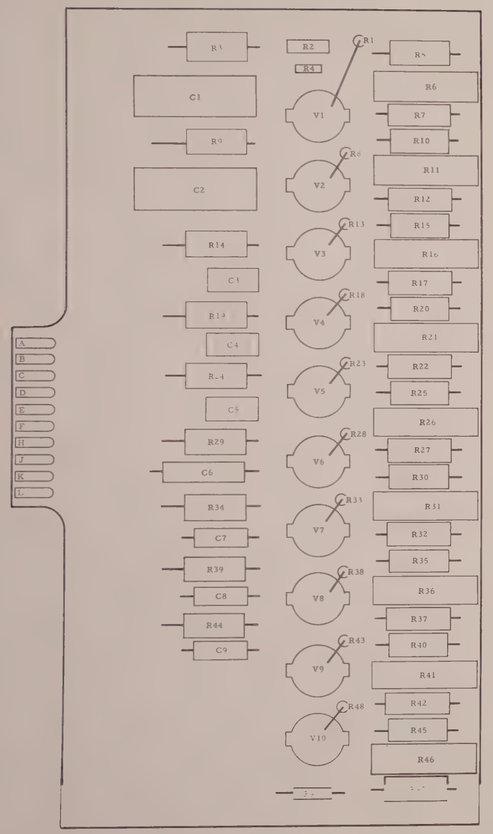
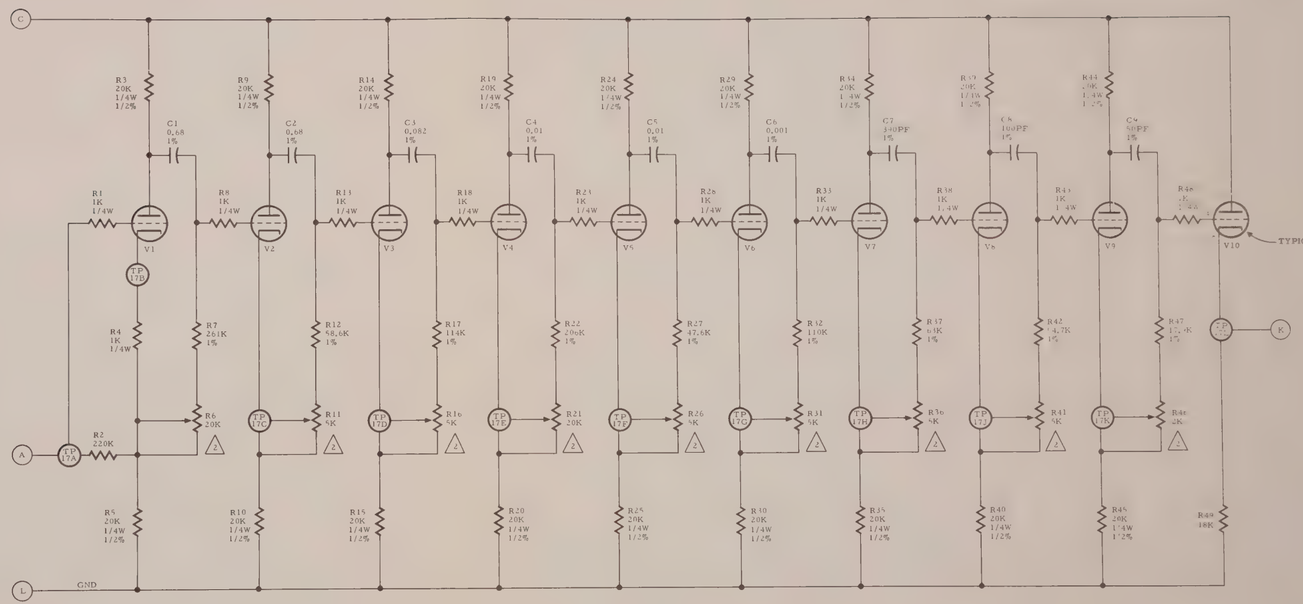


Figure 16a. Component Location - Wideband Phase Shifter (Lower)

REVISIONS		
CHG	DESCRIPTION	DATE
A	Release for publication.	7/65



TYPICAL TUBE FILAMENT

NOTES:

1. RESISTOR VALUES IN OHMS, @ 1/2W, 5%, AND CAPACITOR VALUES IN MICROFARADS, @ 200V, UNLESS OTHERWISE INDICATED.
2. FACTORY ADJUST WITH OPTIMUM VALUE SHOWN.
3. ALL TUBES 7895 NUVISTORS.
4. HIGHEST REFERENCE DESIGNATORS USED:

C9 L R49 TP17L V10

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SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO

SCHEMATIC - WIDE BAND PHASE SHIFTER (LOWER) ASSEMBLY 13026

DRAWN	R. G.	10241	A
APPROVED	R. PETRO		
DATE	30 JULY 1965	SHEET 1 OF 1	

Figure 16b. Schematic - Wideband Phase Shifter (Lower)

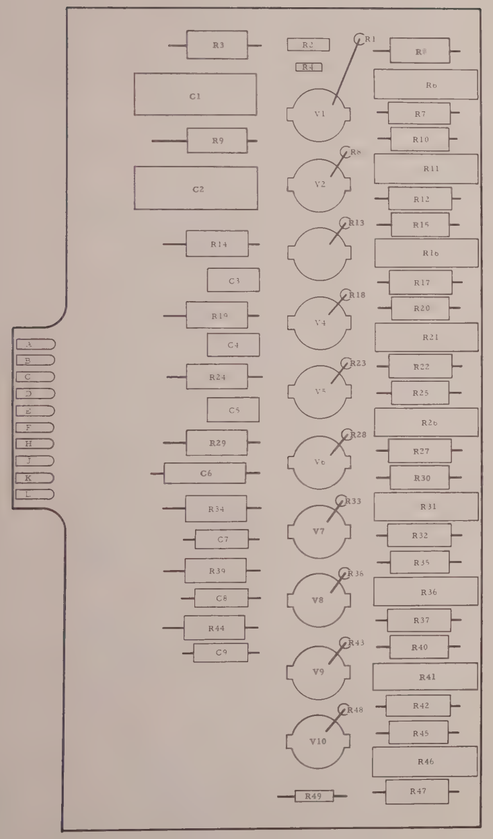

Figure 16c. Component Location - Wideband Phase Shifter (Upper)

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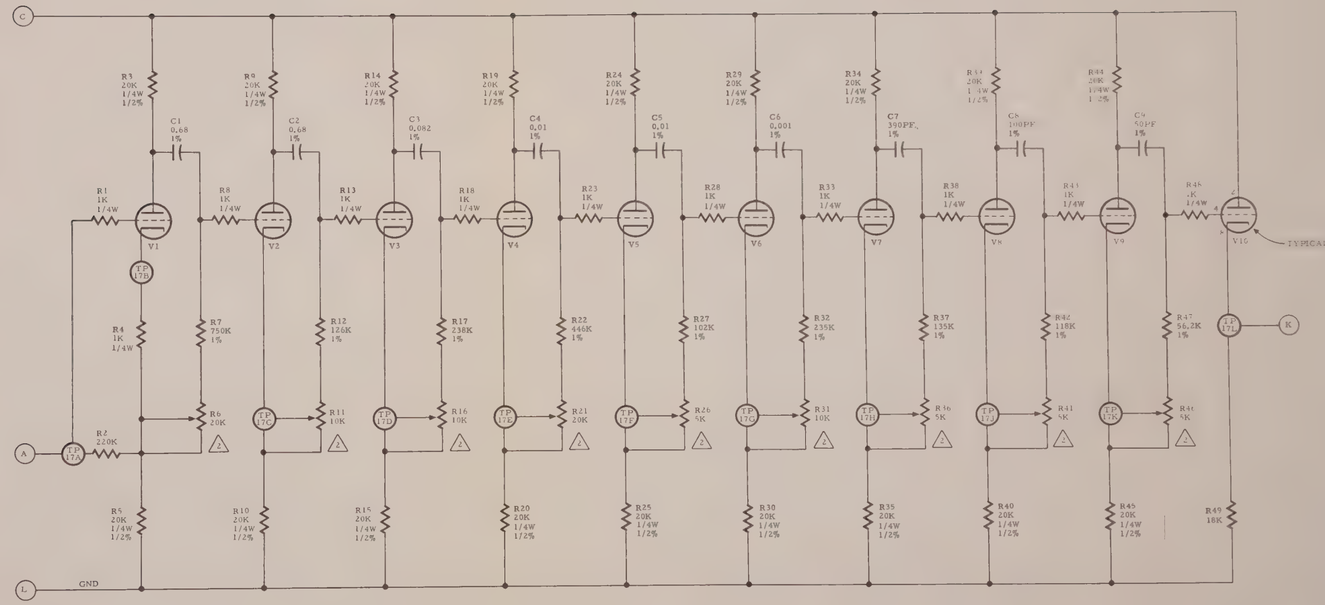
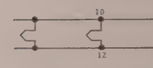
LTR	DESCRIPTION	DATE
A	Redrawn for publication.	7/65





TYPICAL TUBE FILAMENT

NOTES:

1. RESISTOR VALUES IN OHMS, @ 1/2W, 5%, AND CAPACITOR VALUES IN MICROFARADS, @ 200V, UNLESS OTHERWISE INDICATED.
2. FACTORY ADJUST WITH OPTIMUM VALUE SHOWN.
3. ALL TUBES 7895 NUVISTORS.
4. HIGHEST REFERENCE DESIGNATORS USED:
   C9 L R49 TP17L V10

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SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO

SCHEMATIC - WIDE BAND PHASE SHIFT ASSEMBLY 10025 (UPPER)	DRAWN R.C.	10242	A
	APPROVED		
	DATE 30 JULY 1965	SHEET 1 OF 1	

Figure 16d. Schematic - Wideband Phase Shifter (Upper)

with a statement of the apparent difficulty. Return of items to factory is governed by paragraphs Warranty and Shipping in the Preface of this manual.

4-4. TROUBLE SHOOTING.

If a malfunction of the analyzer occurs, refer to the Trouble Shooting Guide in this section. This guide lists probable causes and remedies for improper operation. Make certain that some external situation is not influencing the operation of the unit and that the unit is being operated properly. Look for simple causes. The SD101A is ruggedly constructed with conservative ratings on components. The SD101A should require a minimum of adjustment and repair and provide long trouble-free service.

4-5. MAINTENANCE ADJUSTMENTS.

The following are maintenance checks and adjustments that should be performed periodically as deemed necessary by the users routine calibration cycle. An initial recheck and adjustment of the instrument should be performed after approximately the first 200 hours of operation.

4-6. FREQUENCY RESPONSE. (Test Setup #1, Figure 17)

1. Place the instrument in operation in the normal manner.

2. Holding the input level constant, slowly scan the frequency range noting analyzer meter and filtered signal output level deviations. The frequency response

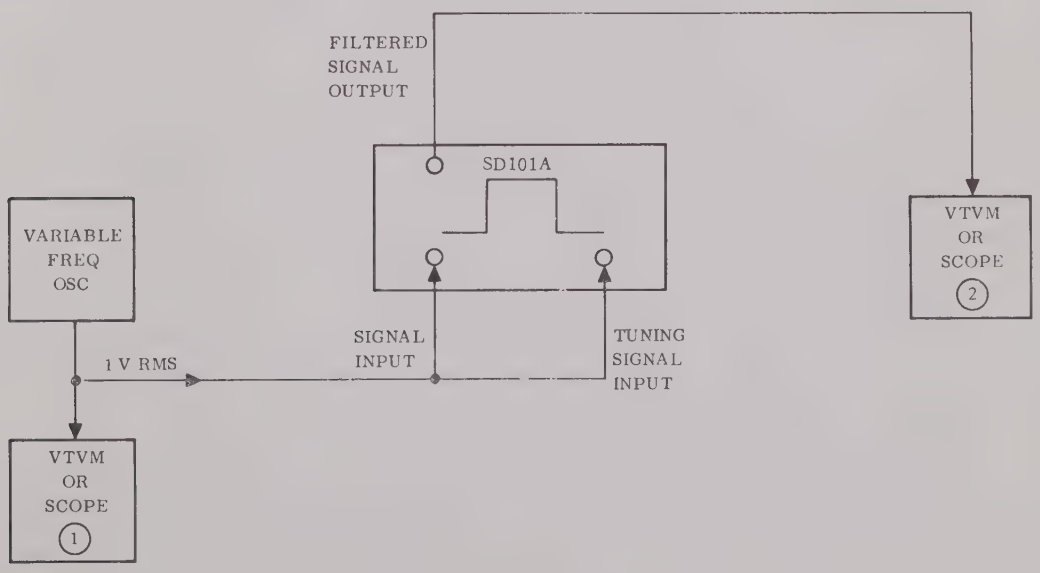


Figure 17. Test Setup #1

4-6. FREQUENCY RESPONSE (Cont'd)

as indicated by the meter, should be within ±2% of full scale from a frequency equal to ½ the filter bandwidth to 25 KC. The filtered signal output response should be ±0.25 DB from a frequency equal to ½ the filter bandwidth to 10 KC and falls off gradually above 10 KC until it is down approximately 1.0 DB at 25 KC. Excessive deviations from this characteristic indicates the wideband phase shifter is in need of factory adjustment or the carrier converter is in need of alignment (See paragraph 4-8).

4-7. SIGNAL MODULATOR BALANCE

To balance the signal modulator, use the same test setup as in 4-6. Disconnect the signal input and short-circuit the signal input terminals. Set the MULTIPLIER on .01 and adjust the tuning frequency to below ½ the bandwidth of the filter and for maximum meter deflection. Adjust the signal modulator balance control (#2, Figure 14) for null. This completes the procedure. There will be a slight fluctuation of the balance but the level of this signal is so low that it should not influence the data at frequencies higher than ½ the filter bandwidth.

4-8. CARRIER CONVERTER SIDEBAND OUTPUT ALIGNMENT

Carrier Converter alignment is required when either of the Wide Band Phase Shift circuit card assemblies (A4 or A5) are repaired or replaced (except for replacement of tubes), V14 is replaced, and in connection with periodic maintenance adjustments.

The following is designed to achieve optimum internal adjustment for lower sideband rejection, and involves the following internal controls:

A12R1 & A12R13 - Carrier Modulator Balance Controls

A12R7 - Carrier Amplitude Balance Control

R73 - Oscillator Phase Control

C90 - 100 KC Voltage Level Adjust

a. Apply 1 volt rms, 2 KC, signal to the front panel TUNING INPUT terminals and adjust the adjacent level control for 1.65 volts p-p, ±0.05 volts, at TB18-1.

   Observe the front panel TUNING AMPLITUDE meter and, if necessary, adjust the value of R252 (TB17-5 to TB18-4) for center-scale meter indication.

b. With the front panel FREQ ADJ control, set the 100 KC Oscillator for 100 KC, ±1 CPS.

   The level of the 100 KC Oscillator, measured at TB19-1, should be 25 volts p-p, ±3 volts p-p, and is adjustable by C90. If a minimum of 25 volts p-p cannot be obtained at TB19-1, add additional capacitance in parallel with C90.

4-8. CARRIER CONVERTER SIDEBAND OUTPUT ALIGNMENT (Cont'd)

c. Connect a Model H-P 310A Wave Analyzer (or equivalent) to the SD101A MKIII rear connector J11 (CARRIER SIG OUT). With the wave analyzer set for 102 KC in the 0 DB range, adjust its input level switch and variable control for a 0 DB indication on the wave analyzer.

d. With the H-P 310A set for 100 KC, adjust A12R1 and A12R13 for a minimum indication on the wave analyzer (greater than -50 DB).

e. With the H-P 310A set for 98 KC, adjust R73 and A12R7 for a minimum indication on the wave analyzer (greater than -50 DB).

f. Repeat steps d. and e. above until no further improvement is noted.

g. Remove the H-P 310A from J11. Connect a scope (with an input impedance ≧10MΩ) to J11 and observe the peak-to-peak amplitude of the carrier signal. If necessary, adjust the value of R283 (TB16-1 to TB16-3) for 65 Vp-p, ±5 volts.

Note: Some units may not actually contain resistor R283 between TB16-1 and TB16-3. Refer to schematic for recommended optimum value.

NOTE

In the absence of a wave analyzer for steps c., d., e. and f. above, the following procedure may be used. However, this method may not necessarily produce optimum performance.

(1) With an oscilloscope at rear connector J11 and without a tuning signal input, adjust A12R1 & A12R13 for minimum indication on the scope. Increase the vertical sensitivity of the scope and repeat adjustment of A12R1 and A12R13 for minimum 100 KC indication.

(2) Apply 1 volt rms, 2 KC, signal to the front panel TUNING INPUT terminals and with the adjacent level control, adjust for 1.65 volts p-p, ±0.05 volts, at TB18-1.

(3) With the scope at rear connector J11, increase the scope vertical sensitivity for a presentation of only the upper portion of the carrier. Adjust A12R6 and the 90° PHASE ADJUST, R73, for minimum ripple on the upper portion of the carrier.

(4) Repeatedly and alternately adjust A12R1 & A12R13 and then A12R6 & R73 for absolute minimum indication and until no further improvement is possible.

4-9. GAIN CONTROL

During routine maintenance, the gain of the input amplifier should be checked with the front panel GAIN control turned fully counter-clockwise to the CALIBRATED position.

After a thorough warmup, set the RANGE switch to 1.0 volt and apply an accurate 1.0 volt RMS 100 CPS signal to the signal input terminals. Adjust internal control R19 (on top of chassis between V2 and V3) for a reading of 10 volts RMS at test point 1 (#1, figure 14).

The gain of the input amplifier is now properly set at X 100.

4-10. CALIBRATION OF INTERNAL CAL REFERENCE

To calibrate the instrument's internal reference against a standard voltmeter, the following procedure is used: (NOTE: Minimum of 45 minutes warmup time)

1. Adjust input amplifier for a gain of 100 (Paragraph 4-9). GAIN control should be in CALIBRATED position.

2. Turn RANGE and MULTIPLIER to CAL, and FILTER switch to Filter 1 (filter bandwidth of 50 CPS or less).

3. Peak FREQ adjustment control carefully for a peak indication on the panel meter, adjusting Filter 1 CAL potentiometer as necessary to keep meter on scale.

4. Turn RANGE switch to 1.0 volt and MULTIPLIER to 1.0.

5. Apply an accurate 1.0 volt RMS 100 CPS signal to the signal input and tuning signal input simultaneously. Adjust Tuning Input control for centerline meter reading.

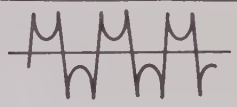
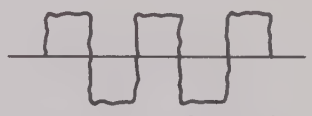
6. Note the front panel meter reading. Adjust the Filter 1 CAL potentiometer for a reading of 1.0 volt.

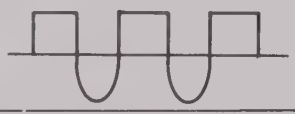
7. Return the RANGE and MULTIPLIER controls to CAL. Note the meter reading. Adjust the potentiometer marked R7 CAL ADJ located on the top left side of the chassis for a reading of 7.

Carefully lock the R7 CAL potentiometer. Recheck the 1.0 volt and CAL meter readings. Repeatability should be within ± 1% of full scale.

The internal reference is now calibrated. Normal operation may now be resumed.

4-11. TROUBLE SHOOTING GUIDE.

SYMPTOM	PROBABLE CAUSE AND REMEDY
1. No Power	Blown fuse. Replace with 2 AMP, 3AG slo-blow. If this fails, remove bottom cover and check for possible short circuit in B+ lead. B+ leads are all the red leads, with exception of leads from the transformers.
2. Distortion of Filtered Signal Output -- (Operational Trouble)	(a) Tuning signal level too low or high. Readjust to center line on tuning amplitude meter. (b) Distortion or noise in tuning signal - Clean up tuning signal waveform. (c) Filter bandwidth too wide for frequency of operation. (d) Input signal level to analyzer too high, overloading input amplifier - Change RANGE switch to higher position.
3. Distortion of Filtered Signal Output - (Equipment malfunction or misalignment) 3a. Unable to calibrate unit having insufficient gain 3b. Tuning Meter comes barely into red band when unit is on CAL	(a) Output waveform  tube failure in wideband phase shifter (#3, figure 12) - Check for sine wave along circuit boards (Test points shown in figure 15.) (b) Output waveform  Trouble same as (a) above or failure of V13 or V15 - Check for sine wave along circuit boards if sine wave present from all stages replace V13 or V15.
4. Excessive noise in filtered signal output	(a) Range Switch in wrong position - Not utilizing full dynamic range of instrument (b) Noise on power line (c) V17 or V18 is noisy - Replace

SYMPTOM	PROBABLE CAUSE AND REMEDY
	(d) Demodulator unbalanced or defective diode (CR1, CR2, CR3, and CR4) (e) Defective or noisy power supply regulator tube V4, V5, V6
5. Frequency Response falls off at low frequency	Load impedance on filtered output too low - Increase to 10K
5a. Frequency Response rises at low frequency	(a) Capacitor lead on wideband phase shifter broken, open resistor - Repair or return boards to factory for repair (b) Signal modulator unbalanced - Balance per Paragraph 4-7
5b. Frequency Response generally poor at all frequencies with dips and peaks in response	(a) Wideband phase shifter needs recalibration - or broken lead on resistor or capacitor in wideband phase shifter (b) Carrier converter needs realignment. (Ref. Paragraph 4-8.)
6. Low meter deflection on CAL and filtered signal output provides approximately 50 MV output max. and is clipped on one side 	C11 shorted, replace with 560 PFD., 200V capacitor
7. No meter deflection or recorder output, filtered signal output OK	(a) V8, V9, or V10 defective - Replace (b) C16 shorted - Replace with 560 PFD, 200V
8. No tuning Meter indication, no meter deflection, unit appears inoperative; power lights on	(a) Carrier Int. - Ext. Switch in wrong position (b) V11, V12, V14, V40, V41, V42, V16, or V19 defective
NOTE Symptoms of 6, 7, and 8 appear with unit in normal operation or in CAL.	

SYMPTOM	PROBABLE CAUSE AND REMEDY
9. No CAL signals, equipment works satisfactorily otherwise	(a) Failure of T1 (b) Broken wire in CAL circuit (c) R7 set wrong
10. Low sensitivity after unit warms up - Unable to calibrate unit - large gain drift	Filter overheating due to defective thermostat

4-12. TROUBLE SHOOTING - GENERAL.

If the above suggestions fail to correct the difficulty, then refer to the various test points cross referenced between the block diagram, schematic, figures 14 and 15, and Paragraph 4-13. Paragraph 4-13 lists the test points and illustrates the waveforms and signal voltage levels that should be present.

4-13. TEST POINTS AND ASSOCIATED WAVEFORMS AND SIGNAL VOLTAGE LEVELS.

The following test points, waveforms and voltage levels were determined under the conditions below:

A. Test Setup:

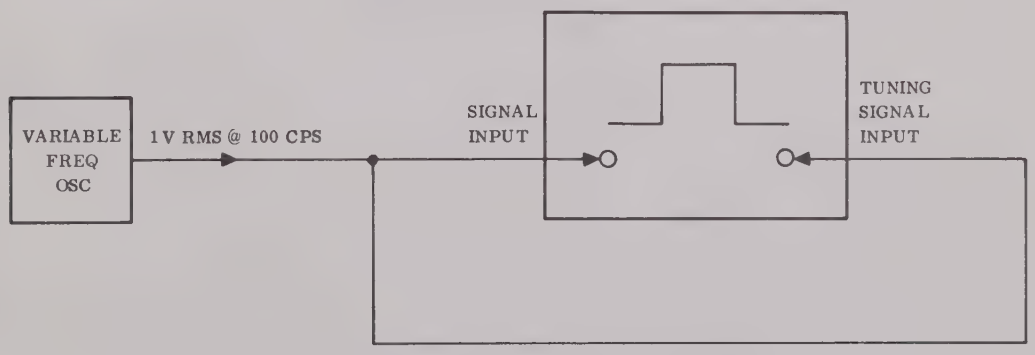
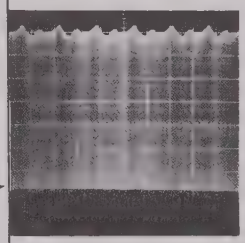
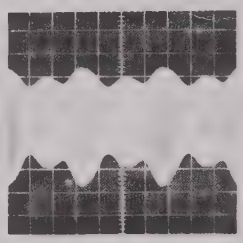
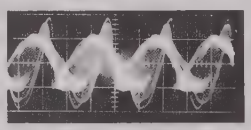
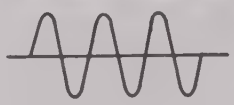


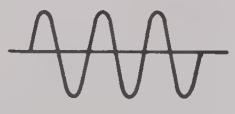
Figure 19. Test Setup #3

B. Voltage and waveforms were measured on a Tektronix #561 Oscilloscope using a 10-megohm probe.

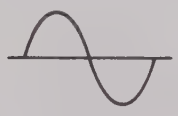
C. Audio frequency amplitude measurements were obtained with a Ballantine #320 VTVM where applicable.

D. RANGE and MULTIPLIER set on 1V and 1.0, respectively, and unit aligned per Paragraph 2-1. (See figure 14 for test point locations.)

TEST POINT	WAVEFORM	VOLTAGE LEVEL
(1) Signal Frequency	Sinewave	Adjust GAIN for 28-30V p-p
(2) Signal Modulator Balance	(Refer to figure 14 for location.)	Refer to paragraph 4-7 for alignment procedure
(3) Upper sideband signal test point used for checking carrier converter alignment NOTE: Upper portion of carrier with the scope set for expanded presentation.	 Carrier Converter properly adjusted  Carrier Converter improperly adjusted	65 ±5V p-p for center scale tuning meter indication
(4) Demodulator Output Suppressed Carrier Signal		.5 V p-p approx.
(5) Tuned Amplifier Output	 100 KC sinewave	12-14V p-p approx.
(6) Meter Amplifier	100 KC slightly distorted sinewave	18 volts p-p approx.

TEST POINT	WAVEFORM	VOLTAGE LEVEL
(7) Oscillator Amplitude Control - Controls amplitude of signal appearing at Test Point (9)	Referenced for location	Early units had a fixed capacitor
(8) Oscillator Phase Control - Used for aligning carrier converter	Referenced for location	
(9) Reference Oscillator Output	100 KC sinewave	Adjust for 25 Vp-p, ±3 Vp-p @ 100 kHz.
(10) (Deleted)		
(11) (Deleted)		
(12) Carrier Modulator Drive Signal	100 KC sinewave	25 Vp-p and approx. equal to TP13.
(13) Carrier Modulator Drive Signal	 100 KC sinewave	25 Vp-p (12) and (13) should be approx. 90° phase difference. The phase shift is adjusted properly when performing alignment procedure (Paragraph 4-8)
(14) Output of Upper Printed Circuit Board	Tuning Signal Frequency Sinewave	1.65 Vp-p, ±0.05 V

TEST POINT	WAVEFORM	VOLTAGE LEVEL
(15) Output of Lower Printed Circuit Board	Tuning Signal Frequency Sinewave	1.65 Vp-p, ±0.05 V TP14 & TP15 approx. equal in amplitude and 90° out of phase.
(16) Output of Tuning Signal Amplifier	Tuning Signal Frequency Sinewave	Approx. 3.3 Vp-p
(17) Wideband Phase Shifter Printed Circuit Cards Test Points (A) through (L) on each card. Ref. Figure 15 and schematic		
(A) Signal Input	Tuning Signal Frequency Sinewave	Approx. 3.3 Vp-p for centerline on tuning meter
(B)-(C)-(D)-(E)-(F)-(G)-(H)-(J)-(K) Cathodes of Paraphase Amplifiers	Tuning Signal Frequency Sinewave	Gain approx. .95 per stage.

TEST POINT	WAVEFORM	VOLTAGE LEVEL
(17) (Continued) (L) Output	 Tuning Signal Frequency Sinewave	1.65 Vp-p, ±0.05 V
(18) Filter Input	 Modulated Signal Frequency	3-4V p-p
(19) (Deleted)		
(20) B+ from Power Supply		150V DC
(21) Recorder Circuit		1.3 - 1.8V DC with recorder output adj. full clockwise
(22) Filtered Signal	 Signal Frequency Sinewave	28 volts p-p with filtered signal output adj. full clockwise

SECTION V

TABLE OF REPLACEABLE PARTS

5-1. GENERAL

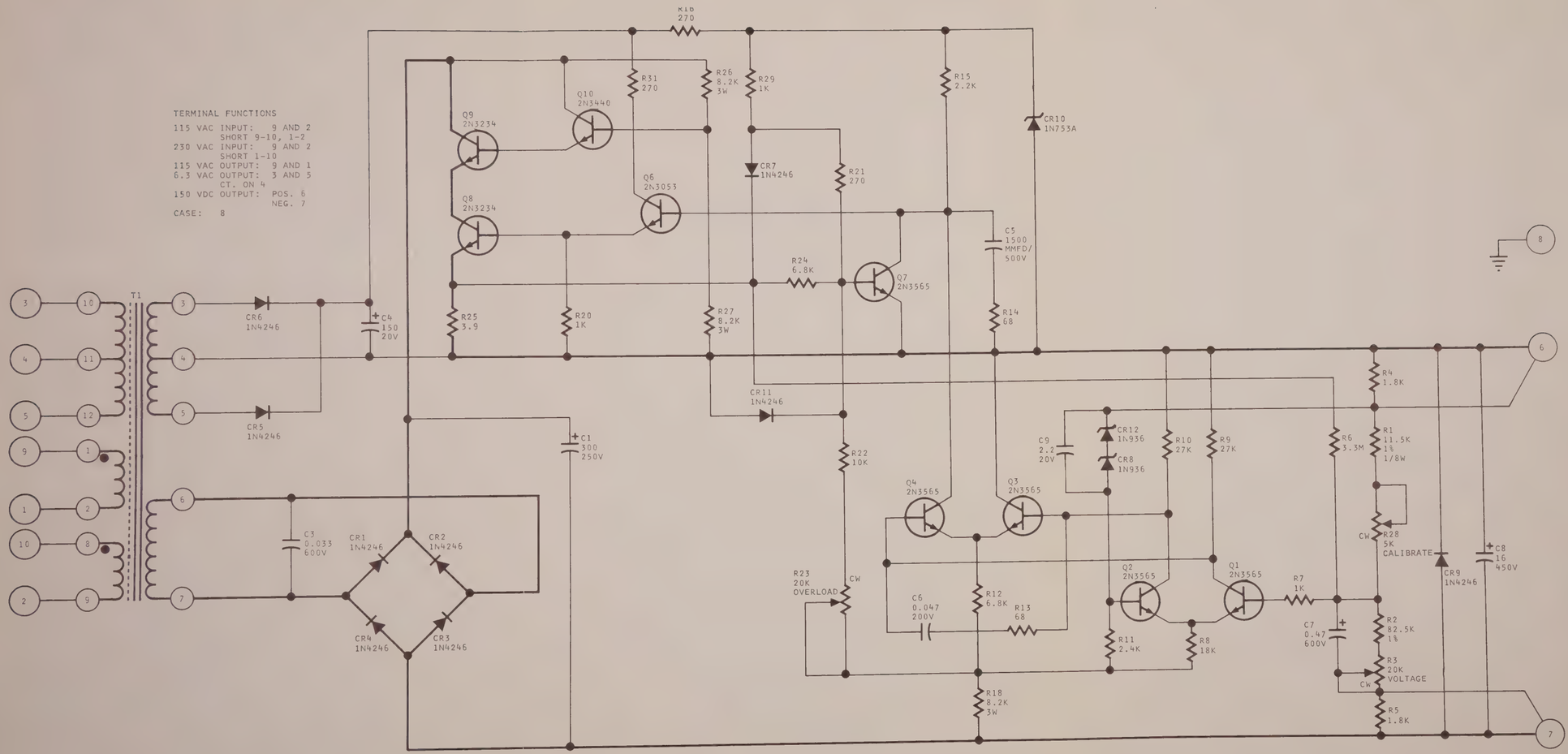
Standard electronic components have been used in this instrument wherever possible and may be ordered direct from Spectral Dynamics Corporation.

All orders for replacement parts and/or assemblies should include available part number information, reference designation, complete description of the item, as well as the Model and serial number of the instrument.

The following table contains a list of special items that must be ordered direct from Spectral Dynamics Corporation in order to ensure complete compatibility.

Table 5-1. Special Replaceable Parts

Reference Designation	Description	Part Number
A1 A2	Filter, Bandpass	Order by Model No.
A3 A3	Oven Assembly (less crystal) Crystal, 100 kHz	20013-112 JK H17T
A4 A5	Wide Band Phase Shift Assy.(A4 Upper) Wide Band Phase Shift Assy.(A5 Lower)	10025-1 10026-1
A6	Filter, 30 kHz Low-Pass	20013-012
A7	Power Supply (115VAC only) Power Supply (115/230VAC)(solid-state)	10050-1 20013-130
A8	Demodulator	20013-013
CR2A/CR2B	Diode, Matched Pair (CD6112)	20013-135
A12CR1-CR4 A12CR5-CR8	Diode, Matched Quad (1N914) Diode, Matched Quad (1N914)	20013-102
M1 M2	Meter, Model 561 Meter, Model 361	10003 10002
T2 T10	Transformer Transformer	20013-059 20013-117
A12T1 A12T2 A12T3 A12T4	Transformer	20013-067



REVISIONS		
CHG	DESCRIPTION	DATE

NOTES:

1. RESISTOR VALUES IN OHMS @ ¼W, 5% AND CAPACITOR VALUES IN MICROFARADS, UNLESS OTHERWISE INDICATED.
2. SPECIFICATIONS:
   - INPUT – 115/230 volts ac, 50 TO 400 Hz.
   - OUTPUTS – 140 - 160 volts dc @ 0.125A.
     115 volts ac @ 50VA max. unreg.
     6.3 volts ac @ 9A max. unreg.
   - REGULATION – 0.05% for line changes of 10%.
     0.05% for NL to FL.
   - RIPPLE – 1 millivolt rms maximum.
3. HIGHEST REFERENCE DESIGNATORS USED:

   C9 CR12 Q10 R31 T1

SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO

SCHEMATIC - POWER SUPPLY	DRAWN L.W.	20013-130
	APPROVED	
	DATE 7 SEP 1966	SHEET 2 OF 2

REVISIONS		
CHG	DESCRIPTION	DATE
A	REDRAWN & RELEASED. R.P.	4/67
B	INCORP. ECO 416 EFFECTIVE ALL FUTURE PRODUCTION. WICKLUND	10/67

BALANCED MODULATORS
ASSEMBLY 10568-1

100 KHZ INPUT
F1
GRN
T1
RED
ORN
BLU/YEL
BRN
R1
2K
CW
CR1 1N914
CR3 1N914
CR2 1N914
CR4 1N914
R2 910
R3 910
GRN
T2
ORN
BLU/YEL
BRN
RED
R4 5.1K
R5 56K
L2
INPUT FROM WIDE BAND PHASE SHIFTER (UPPER)

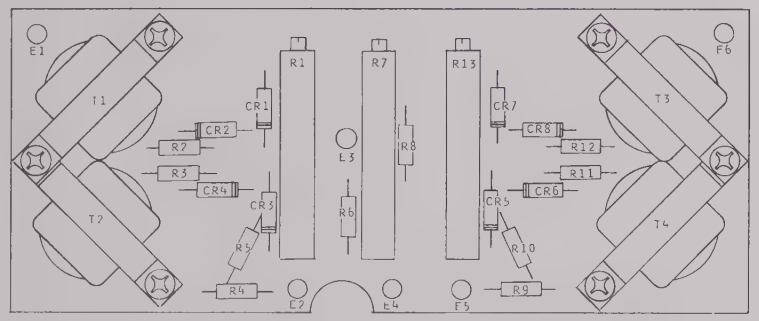
100 KHZ INPUT
E6
RED
T3
GRN
ORN
BRN
BLU/YEL
R13 2K
CW
CR5 1N914
CR7 1N914
CR6 1N914
CR8 1N914
R11 910
R12 910
ORN
T4
GRN
BLU/YEL
BRN
RED
R9 5.1K
R10 56K
E5
INPUT FROM WIDE BAND PHASE SHIFTER (LOWER)

R6 10K,1/8W,1%
R7 5K
CW
R8 10K,1/8W,1%

E4

E3
SUMMED OUTPUT TO BANDPASS AMPLIFIER

NOTES:
1. RESISTOR VALUES IN OHMS @1/4W, 5%, UNLESS OTHERWISE INDICATED.
2. MATCHED QUAD PER SDC SPEC. 20013-102.
3. HIGHEST REFERENCE DESIGNATORS USED:
CR8 E6 R13 T4



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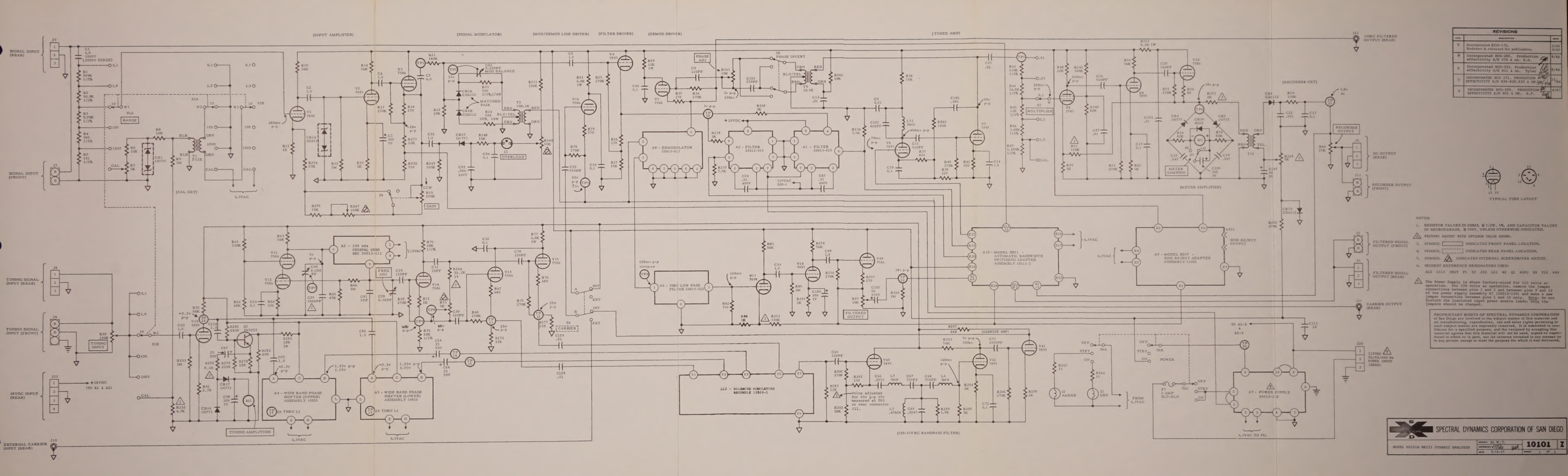
SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO

BALANCED MODULATORS ASSEMBLY 10568-1

DRAWN R. PETRO
APPROVED
DATE 4-19-67

10612 B

SHEET 1 OF 1



REVISIONS		
LTR	DESCRIPTION	DATE
V	Incorporated ECO-172, Redrawn & released for publication.	2/65 9/65
W	Incorporated ECO-286. Production effectivity S/N 476 & on. R.G.	8/66
X	Incorporated ECO-331. Production effectivity S/N 811 & on. Tyler	8/66
Y	INCORPORATED ECO 371. PRODUCTION EFFECTIVITY S/N 826-838,855 & ON. R.P.	11/67
Z	INCORPORATED ECO-393. PRODUCTION EFFECTIVITY S/N 902 & ON. R.P.	6/67

NOTES:
1. RESISTOR VALUES IN OHMS, @ 1/2W, 5%, AND CAPACITOR VALUES IN MICROFARADS, @ 200V, UNLESS OTHERWISE INDICATED.
2. FACTORY ADJUST WITH OPTIMUM VALUE SHOWN.
3. SYMBOL: INDICATES FRONT PANEL LOCATION.
4. SYMBOL: INDICATES REAR PANEL LOCATION.
5. SYMBOL: INDICATES INTERNAL SCREWDRIVER ADJUST.
6. HIGHEST REFERENCE DESIGNATORS USED:
   A12 C111 CR19 F1 J3 J32 L11 M2 Q1 R283 S9 T10 V49
7. The Power Supply is shown factory-wired for 115 volts ac input. Before the unit is put in operation, remove the jumper connections between pins 1 and 2 (200) between pins 9 and 10 of the power supply assembly A7 (20013-130). Make sure that jumper connection between pins 1 and 10 only. Do not disturb the insulated input power source leads; only the jumpers should be changed.

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SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO

MODEL SD101A MKIII DYNAMIC ANALYZER

DRAWN M. W. 7-
CHECKED
DATE 9-14-65

10101 Z

SHEET 1 OF 1